REMARKS

In the non-final Office Action, the Examiner rejected claims 1-5, 10-13, 16, 17, 20-24, and 26-30 under 35 U.S.C. § 102(e) as anticipated by Dasylva et al. (U.S. Patent Application Publication No. 2002/0118415); rejected claim 7 under 35 U.S.C. § 103(a) as unpatentable over Dasylva et al. in view of Peterson et al. (U.S. Patent No. 4,880,996); rejected claims 9 and 15 under 35 U.S.C. § 103(a) as unpatentable over Dasylva et al. in view of Suzuki (U.S. Patent No. 6,324,318); and rejected claims 8, 14, and 25 under 35 U.S.C. § 103(a) as unpatentable over Dasylva et al. in view of Peterson et al. and Furusawa et al. (U.S. Patent No. 6,636,342). The Examiner objected to claims 6, 18, and 19 as dependent upon a rejected base claim that would be allowable if rewritten in independent form to include all of the features of the base claim and any intervening claims.

By this Amendment, Applicant cancels claims 3, 12, 16, 21, and 27 without prejudice or disclaimer and amends claims 1, 7, 11, 13, 17-20, 22, 24-26, and 28-30 to improve form. Applicant appreciates the Examiner's identification of allowable subject matter, but traverses the Examiner's rejections under 35 U.S.C. §§ 102 and 103 with regard to the claims as now amended. Claims 1, 2, 4-11, 13-15, 17-20, 22-26, and 28-30 are pending.

In paragraph 2 of the Office Action, the Examiner rejected pending claims 1, 2, 4, 5, 10, 11, 13, 17, 20, 22-24, 26, and 28-30 under 35 U.S.C. § 102(e) as allegedly anticipated by Dasylva et al. Applicant respectfully traverses the rejection with regard to the claims as amended herein.

A proper rejection under 35 U.S.C. § 102 requires that a single reference teach every aspect of the claimed invention either expressly or impliedly. Any feature not directly taught must be inherently present. In other words, the identical invention must be shown in as complete

detail as contained in the claim. See M.P.E.P. § 2131. Dasylva et al. does not disclose or suggest the combination of features recited in claims 1, 2, 4, 5, 10, 11, 13, 17, 20, 22-24, 26, and 28-30.

Amended independent claim 1, for example, recites a wavelength division multiplexer for multiplexing optical input signals. The multiplexer comprises a plurality of wavelength converters and a coupler. The wavelength converters receive optical input signals with a common wavelength and different optical pump signals and output output signals with wavelengths that are differently shifted relative to the common wavelength of the optical input signals. The coupler combines the output signals from the wavelength converters into a multiplexed signal.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 1. For example, Dasylva et al. does not disclose or suggest wavelength converters that, among other things, receive optical input signals with a common wavelength and different optical pump signals. Instead, Dasylva et al. discloses wavelength converters that are dedicated to receive input signals of different frequencies (Fig. 4; paragraphs 0058 and 0059). Therefore, Dasylva et al.'s wavelength converters cannot correspond to the wavelength converters recited in Applicant's claim 1.

Moreover, because the wavelength converters in Dasylva et al. receive input signals of different frequencies, the wavelength converters in Dasylva et al. cannot output output signals with wavelengths that are differently shifted relative to the common wavelength of the input signals, as further required by claim 1.

For at least these reasons, Applicant submits that claim 1 is not anticipated by Dasylva et al. Claims 2, 4, 5, 10, and 11 depend from claim 1 and are, therefore, not anticipated by Dasylva et al. for at least the reasons given with regard to claim 1. Claims 2, 4, 5, 10, and 11 are also not anticipated by Dasylva et al. for reasons of their own.

For example, claim 5 recites that the (a) groups of wavelength converters include (a) groups of $n^{1/a}$ wavelength converters, where a first group of the $n^{1/a}$ wavelength converters receives the optical input signals and outputs wavelength-shifted output signals to a next group of the $n^{1/a}$ wavelength converters, where ($n^{1/a}$) is an integer greater than 1. Dasylva et al. does not disclose or suggest the combination of features recited in claim 5.

The Examiner alleged that Dasylva et al. discloses $n^{1/a}$ wavelength converters 303 and 306 (Office Action, page 3). Applicant disagrees. Claim 4, from which claim 5 depends, recites that n refers to the number of optical input signals and (a) refers to the number of groups of wavelength converters, where both n and (a) are greater than 1. In Figs. 3 and 4, Dasylva et al. shows 2 groups of wavelength converters (303 and 306) and W/k input signals. Dasylva et al. does not disclose or suggest that each of the 2 groups of wavelength converters includes $W/k^{1/2}$ wavelength converters, as would be required by claim 5. Instead, Dasylva et al. discloses that each of the 2 groups of wavelength converters includes W/k wavelength converters--equal to the number of input signals.

For at least these additional reasons, Applicant submits that claim 5 is not anticipated by Dasylva et al.

Amended independent claim 13 recites a method for wavelength division multiplexing in a system including a plurality of wavelength converters and a coupler. The method comprises

receiving, by the wavelength converters, optical input signals with a common wavelength; receiving, by the wavelength converters, different optical pump signals; shifting, by the wavelength converters, the common wavelength of the optical input signals based on wavelengths of the optical pump signals to produce differently shifted output signals; and combining the shifted output signals into a combined signal by the coupler.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 13. For example, Dasylva et al. does not disclose or suggest receiving, by a plurality of wavelength converters, optical input signals with a common wavelength. Instead, Dasylva et al. discloses wavelength converters that are dedicated to receive input signals of different frequencies (Fig. 4; paragraphs 0058 and 0059).

Moreover, because Dasylva et al. does not disclose or suggest receiving optical input signals with a common wavelength, Dasylva et al. cannot disclose or suggest shifting, by the wavelength converters, the common wavelength of the optical input signals based on wavelengths of the optical pump signals to produce differently shifted output signals, as further required by claim 13.

For at least these reasons, Applicant submits that claim 13 is not anticipated by Dasylva et al. Claims 17 and 20 depend from claim 13 and are, therefore, not anticipated by Dasylva et al. for at least the reasons given with regard to claim 13.

Amended independent claim 22 recites a wavelength division multiplexer for multiplexing n optical input signals, where n is an integer greater than 1. The multiplexer comprises a first group of wavelength converters receiving the n optical input signals and outputting n wavelength-shifted output signals; a second group of wavelength converters

receiving the n wavelength-shifted output signals from the first group and outputting n second output signals, where each of the n second output signals has a unique wavelength; and a coupler combining the second output signals from the second group of wavelength converters into a multiplexed signal. Each of the wavelength converters in the first and second groups receives m input signals and outputs m output signals having wavelengths that are shifted relative to wavelengths of the m input signals, where m is an integer greater than 1.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 22. For example, Dasylva et al. does not disclose or suggest wavelength converters in first and second groups that each receives m input signals and outputs m output signals having wavelengths that are shifted relative to wavelengths of the m input signals, where m is an integer greater than 1. Instead, Dasylva et al. discloses that each of the wavelength converters receives a single input signal and outputs a single output signal (Figs. 3 and 4; paragraphs 0058 and 0059).

For at least these reasons, Applicant submits that claim 22 is not anticipated by Dasylva et al. Claim 23 depends from claim 22 and is, therefore, not anticipated by Dasylva et al. for at least the reasons given with regard to claim 22. Claim 23 is also not anticipated by Dasylva et al. for reasons of its own.

Claim 23 recites that each of the wavelength converters in the second group is coupled to a plurality of different wavelength converters in the first group, so that each of the n second output signals has passed through a unique pair of wavelength converters. Dasylva et al. does not disclose or suggest the combination of features recited in claim 23. For example, Dasylva et al. does not disclose or suggest that each of the wavelength converters in the second group is coupled to a plurality of different wavelength converters in the first group. Instead, Dasylva et al.

discloses that each of the wavelength converts in the second group is coupled to exactly one wavelength converter in the first group (Fig. 3).

The Examiner did not address the features of claim 23. Therefore, the Examiner did not establish a proper case of anticipation with regard to claim 23.

For at least these additional reasons, Applicant submits that claim 23 is not anticipated by Dasylva et al.

Amended independent claim 24 recites a wavelength division multiplexer for multiplexing n optical input signals having a common wavelength from one or more network devices, where n is an integer greater than 1. The multiplexer comprises n wavelength converters, where each of the wavelength converters receives one of the n optical input signals with the common wavelength and an optical pump signal and optically generates one output signal having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals. The multiplexer also comprises a coupler combining the output signals from the n wavelength converters into a combined signal.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 24. For example, Dasylva et al. does not disclose or suggest n wavelength converters, where each of the wavelength converters receives one of the n optical input signals with the common wavelength and an optical pump signal and optically generates one output signal having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals (emphasis added). Instead, Dasylva et al. discloses wavelength converters that are dedicated to receive input signals of different frequencies (Fig. 4; paragraphs 0058 and 0059).

For at least these reasons, Applicant submits that claim 24 is not anticipated by Dasylva et al.

Amended independent claim 26 recites a wavelength division multiplexer for multiplexing optical input signals from one or more network devices. The multiplexer comprises a first group of wavelength converters, a second group of wavelength converters, and a coupler. Each of the wavelength converters in the first group receives a plurality of the optical input signals and an optical pump signal and optically generates a plurality of first output signals each having a wavelength that is shifted based on a wavelength of the pump signal. Each of the wavelength converters in the second group receives at least one first output signal from each of the wavelength converters in the first group and an optical pump signal and optically generates a plurality of second output signals each having a wavelength that is shifted based on a wavelength of the pump signal. The coupler optically couples to the second group of wavelength converters to combine the second output signals into a combined signal.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 26. For example, Dasylva et al. does not disclose or suggest a first group of wavelength converters, where each of the wavelength converters in the first group, among other things, receives a plurality of the optical input signals. Instead, Dasylva et al. discloses that each of the wavelength converters receives a single dedicated input signal (Figs. 3 and 4; paragraphs 0058 and 0059).

Dasylva et al. also does not disclose or suggest a second group of wavelength converters, where each of the wavelength converters in the second group, among other things, receives at least one first output signal from each of the wavelength converters in the first group. Instead,

Dasylva et al. discloses that a wavelength converter, such as wavelength converter 306 in Fig. 3, receives an output signal from just one other wavelength converter 303 (Fig. 3; paragraph 0053).

The Examiner did not address these features of claim 26. Therefore, the Examiner did not establish a proper case of anticipation with regard to claim 26.

For at least these reasons, Applicant submits that claim 26 is not anticipated by Dasylva et al.

Amended independent claim 28 recites features similar to features recited in claim 26. Claim 28 is, therefore, not anticipated by Dasylva et al. for reasons similar to reasons given with regard to claim 26.

Amended independent claim 29 recites a wavelength division multiplexing system for transmitting n optical input signals, where n is an integer greater than 1. The system comprises n wavelength converters, a coupler, an optical fiber, and a splitter. Each of the wavelength converters is configured to receive one of n optical input signals having a common wavelength and an optical pump signal and optically generate one output signal having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals. The coupler combines the output signals from the n wavelength converters into a combined signal. The optical fiber carries the combined signal. The splitter receives the combined signal from the optical fiber and produces the n output signals, each having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 29. For example, Dasylva et al. does not disclose or suggest n wavelength converters, where each of

the wavelength converters is configured to receive one of n optical input signals having a common wavelength and an optical pump signal and optically generate one output signal having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals (emphasis added). Instead, Dasylva et al. discloses wavelength converters that are dedicated to receive input signals of different frequencies (Fig. 4; paragraphs 0058 and 0059).

Dasylva et al. also does not disclose or suggest a splitter that receives the combined signal from the optical fiber and produces the n output signals, each having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals, as further recited in claim 29. The Examiner did not address this feature and, therefore, did not establish a proper case of anticipation with regard to claim 29.

For at least these reasons, Applicant submits that claim 29 is not anticipated by Dasylva et al.

Amended independent claim 30 recites a network comprising one or more network devices, a wavelength division multiplexing system, and one or more other network devices. The one or more network devices is/are selected from the group including switches, routers, and add-drop multiplexers. The one or more network devices is/are configured to produce n optical input signals with a common wavelength, where n is an integer. The wavelength division multiplexing system is configured to receive the n optical input signals with the common wavelength and remotely deliver n optical output signals with different wavelengths. The system includes a plurality of wavelength converters, where each of the wavelength converters is configured to receive a plurality of the n optical input signals with the common wavelength and an optical

pump signal and optically generate a plurality of the n optical output signals, and where each of the n optical output signals has a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals. The one or more other network devices is/are selected from the group including switches, routers, and add-drop multiplexers. The one or more other network devices is/are configured to receive the n optical output signals with different wavelengths.

Dasylva et al. does not disclose or suggest the combination of features recited in claim 30. For example, Dasylva et al. does not disclose or suggest a plurality of wavelength converters, where each of the wavelength converters is configured to receive a plurality of the n optical input signals with the common wavelength and an optical pump signal and optically generate a plurality of the n optical output signals, and where each of the n optical output signals has a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals (emphasis added). Instead, Dasylva et al. discloses wavelength converters that receive a single input signal of a different frequency and generates a single output signal (Figs. 3 and 4; paragraphs 0053, 0058, and 0059).

For at least these reasons, Applicant submits that claim 30 is not anticipated by Dasylva et al.

In paragraph 4 of the Office Action, the Examiner rejected claim 7 under 35 U.S.C. 103(a) as allegedly unpatentable over Dasylva et al. in view of Peterson et al. Applicant respectfully traverses the rejection.

Claim 7 depends from claim 1. Without acquiescing in the Examiner's rejection, Applicant submits that the disclosure of Peterson et al. does not cure the deficiencies in the

disclosure of Dasylva et al. identified above with regard to claim 1. Therefore, claim 7 is patentable over Dasylva et al. and Peterson et al., whether taken alone or in any reasonable combination, for at least the reasons given with regard to claim 1.

In paragraph 5 of the Office Action, the Examiner rejected claims 9 and 15 under 35 U.S.C. 103(a) as allegedly unpatentable over Dasylva et al. in view of Suzuki. Applicant respectfully traverses the rejection.

Claims 9 and 15 depend from claims 1 and 13, respectively. Without acquiescing in the Examiner's rejection, Applicant submits that the disclosure of Suzuki does not cure the deficiencies in the disclosure of Dasylva et al. identified above with regard to claims 1 and 13. Therefore, claims 9 and 15 are patentable over Dasylva et al. and Suzuki, whether taken alone or in any reasonable combination, for at least the reasons given with regard to claims 1 and 13.

In paragraph 6 of the Office Action, the Examiner rejected claims 8, 14, and 25 under 35 U.S.C. 103(a) as allegedly unpatentable over Dasylva et al. in view of Peterson et al. and Furusawa et al. Applicant respectfully traverses the rejection.

Claims 8 and 14 depend from claims 1 and 13, respectively. Without acquiescing in the Examiner's rejection, Applicant submits that the disclosures of Peterson et al. and Furusawa et al. do not cure the deficiencies in the disclosure of Dasylva et al. identified above with regard to claims 1 and 13. Therefore, claims 8 and 14 are patentable over Dasylva et al., Peterson et al., and Furusawa et al., whether taken alone or in any reasonable combination, for at least the reasons given with regard to claims 1 and 13.

Amended independent claim 25 recites a wavelength division multiplexer for multiplexing n optical input signals having a common wavelength from one or more network

devices, where n is an integer greater than 1. The multiplexer comprises n wavelength converters and a coupler. Each of the wavelength converters receives one of the n optical input signals with the common wavelength and an optical pump signal and optically generates one output signal having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals. Each of the wavelength converters includes a nonlinear crystal receiving the one input signal and the optical pump signal and optically shifting the wavelength of the one input signal to produce an intermediate signal, and a filter connected to an output of the nonlinear crystal to filter the intermediate signal and produce the one output signal. The coupler combines the output signals from the n wavelength converters into a combined signal.

Neither Dasylva et al., Peterson et al., nor Furusawa et al., whether taken alone or in any reasonable combination, discloses or suggests the combination of features recited in claim 25. For example, neither Dasylva et al., Peterson et al., nor Furusawa et al. discloses or suggests n wavelength converters, where each of the wavelength converters receives one of the n optical input signals with the common wavelength and an optical pump signal and optically generates one output signal having a wavelength that is shifted relative to the common wavelength by a different amount from wavelengths of other ones of the output signals (emphasis added). As explained above, Dasylva et al. does not disclose or suggest these features. The disclosures of Peterson et al. and Furusawa et al. do not cure the deficiencies in the disclosure of Dasylva et al.

For at least these reasons, Applicant submits that claim 25 is patentable over Dasylva et al., Peterson et al., and Furusawa et al., whether taken alone or in any reasonable combination.

In view of the foregoing amendments and remarks, Applicant respectfully requests the Examiner's reconsideration of the application and the timely allowance of pending claims 1, 2, 4-11, 13-15, 17-20, 22-26, and 28-30.

If the Examiner does not believe that all pending claims are now in condition for allowance, the Examiner is urged to contact the undersigned to expedite prosecution of this application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1070 and please credit any excess fees to such deposit account.

Respectfully submitted,

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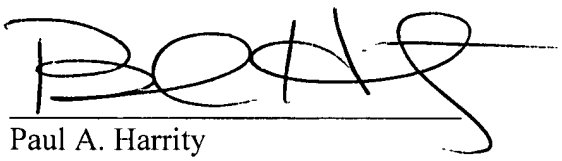

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